AMENDMENTS TO THE DRAWINGS

Applicants propose to add the legend "(PRIOR ART)" to Figures 3A, 3B and 4. Corrected drawings are annexed to this response.

REMARKS

I. Amendments to the title:

We propose to replace the title in accordance with the suggestion made by the Examiner.

The new title is based on the independent claims 1 and 9 and clearly indicates the invention to which these claims are directed.

II. Drawings Corrections:

We propose to replace Figures 3A, 3B and 4 in accordance with the suggestion made by the Examiner. More precisely, Figures 3A, 3B and 4 has been designated by the legend "Prior Art".

III. Claims Amendments:

The claims have been amended in order to better characterize the invention, in particular in view of the teachings of Kern et al. (US 4,361,808).

No new matter has been added by way of these amendments.

For sake of clarity, amendments to the claims are reflected in the enclosed listing of claims.

IV. Claims Rejections under 35 USC 102 and 35 USC 103:

The Examiner rejected claims 1-3, 5-9, and 11-14 under 35 USC 102(b) as being anticipated by Kern et al. (US 4,361,808). Further, the Examiner rejected claims 4, 10 and 15 under 35 USC 103(a) as being unpatentable over Kern et al. in view of Applicant Admitted Prior Art (AAPA).

We respectfully disagree with the Examiner's reasoning that forms the basis of these rejections.

The present invention relates to micro-resistivity measurement that makes use of a pad that is urged against the wellbore wall.

A drawback of the prior art apparatus and method used to perform micro-resistivity measurement in borehole filled with non-conductive fluid (e.g. oil based mud) is that the pad

must be close to the borehole wall in order to discriminate between the properties of the borehole fluid and the properties of the geological formation. When the pad is not close to the borehole wall, a measurement of the voltage difference (dV) between the electrodes will represent the properties of the borehole fluid and not the properties of the formation. Thus, resistivity images will not be accurate and cannot be interpreted. Such a situation will typically occur in rugged or rough borehole. For example, a rugged or rough borehole resulting in pad standoff of about 5 mm is unacceptable for measuring a resistivity formation of 0.1 Ω.m.

According to the invention, only the component of the voltage difference dV signals in phase with the formation current (or total current) intervenes in the resistivity calculation. Indeed, the signals provided from the non-conductive fluid and the insulating material around the voltage difference dV electrodes are out of phase with the current. In the present invention, the in phase voltage (with current) enables distinguishing current that is going in the earth formation from current that is leaking due to the capacitive leakage of the pad.

Consequently, the invention enables discriminating against unwanted signals when measuring the resistivity of geological formations in borehole filled with non-conductive fluid (e.g. oil-based mud). The invention enables performing accurate measurement with a pad positioned at a greater distances from the borehole than prior art measuring device/method. The invention makes use of AC signals having a frequency inferior to about 100 kHz.

Kern et al. describe a method and system for measuring the dielectric constant of earth formations adjacent to a bore hole. Kern et al. teaches an apparatus comprising (see claim 1):

- A current source **12** capable of supplying alternating current of a substantially constant magnitude to said portion **4** of earth formation,

- A reference resistor ER **14** in series with the current source **12** and said portion **4** of earth formation,

- A first differential amplifier **28** for measuring the voltage Es across said portion **4** of earth formation,

- A second differential amplifier **26** for measuring the voltage ER across the reference resistor **14**,

- Means for generating a positive first voltage with substantially the magnitude of the voltage across said portion 4 of earth formation,

- A four–quadrant multiplier **104** having as inputs the voltage across the reference resistor **14** and the positive first voltage generated,

- A first amplifier **106** with a predetermined gain connected to the multiplier **104** for amplifying the multiplier output so that the output voltage of the first amplifier is substantially in phase with the voltage across the reference resistor **14** but has substantially the magnitude of the voltage across said portion **4**, and

- A second amplifier for taking the voltage difference EΦ between the voltage Es across said portion **4** and the output Ez of the first amplifier **106** so that the capacitance Cs of said portion **4** may be determined from a relationship between Es, ER, R, EΦ, a pulsation ω of the injected current, and a borehole correction factor α.

Thus, Kern et al. are interested in determining the capacitance of an investigated portion of an earth formation. As illustrated in the drawings, namely Figs 1 and 10, and as emphasized in the description, namely col. 6 lines 49-51, a stable contact is maintained between the electrodes and the borehole wall.

Kern et al. are not interested in giving a solution to the hereinbefore mentioned drawback of prior art apparatuses and methods like the present invention. Indeed, Kern et al. will typically show the drawbacks of the background art as explained in connection with the description of Figure 3A and 3B (page 6 last paragraph) of the present patent application. Further, Kern et al. do not describe or suggest the features of the method of the invention, and in particular calculating a formation current by subtracting a leakage current (I_L) from the total current (I), and determining an amplitude of a component of the voltage in phase with the formation current. In contradistinction, Kern et al. do not to take in account leakage of current due to the measuring apparatus itself, because obviously Kern et al. is not interested in performing micro investigation. Kern et al. is interested in determining a value of the permittivity of the formation.

Consequently, the teachings of Kern et al. do not describe or suggest the hereinbefore mentioned distinguishing features of the present invention. Therefore, amended claims which incorporate these distinguishing features are clearly novel over the teachings of Kern et al.

Further, Kern et al. do not enable performing micro electrical investigation of the bore hole wall as hereinbefore explained. Therefore, a skilled person considering the teaching of Carlson would not obviously derive the present invention as claimed in amended claims, even when considering AAPA. Consequently, amended claims which incorporate the hereinbefore mentioned distinguishing features are inventive.

In conclusion, the amended claims define a solution that differs substantially and fundamentally from the solution that Kern et al. propose. Consequently, the claims are novel and inventive with respect to Kern et al. Thus, the amended claims including the dependent claims are allowable over the prior art.

CONCLUSION

Applicant is of the opinion that this reply is fully responsive to all outstanding issues. Accordingly, the application is now deemed to be in condition for allowance, and notice to that effect is solicited.

This paper is submitted in response to the Office Action mailed 10 March 2006 for which the three-month date for response is 10 June 2006. Please apply any charges not covered, or any credits, to Deposit Account 50-2183 (Reference Number 21.1042).

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